

National Science Foundation
Directorate for Biological Sciences

BIO ADVISORY COMMITTEE
Room 375 Stafford I
April 29 - May 1, 2009

Minutes

Wednesday April 29

Welcome and Approval of Minutes

Dr. Michael Mares, Chair of the Advisory Committee for Biological Sciences (BIO AC), convened the Spring 2009 meeting at 8:30 am with a welcome to the members and guests. Dr. James P. Collins, Assistant Director for the Biological Sciences (BIO), greeted the BIO AC and asked the AC members to introduce themselves. The minutes for the April 2008 meeting were unanimously approved by the Committee.

“One Biology” - Dr. James P. Collins, Assistant Director, BIO

Dr. Collins gave an overview of the BIO Directorate and discussed the upcoming NRC 21st Century Biology Report. His remarks were framed around four themes: the Arc of Biology, Life in Transition (LiT), Life Sciences in Transition and Managing the Life Sciences in Transition. Under Life in Transition he discussed three research emphases: Origins of Life, Energy, and Adaptation. Dr. Collins discussed the growth in interdisciplinary science and asked how the next generation of Biology students should be educated so they can engage in such science. BIO's experiments in innovation for supporting transformative research were highlighted. Among these are a new collaboration between BIO and GEO in the area of Integrated Global System Science (IGSS). As a first activity, IGSS released two Dear Colleague Letters: *Emerging Topics in Biogeochemistry* and *Multiscale Modeling* that encouraged researchers to submit proposals in these areas. Also described was a novel, real-time peer review mechanism, the “Sandpit”, that BIO is exploring as a way to identify and support novel solutions to research problems. Dr. Collins reported that the National Ecological Observatory Network's (NEON) preliminary design review (PDR) is scheduled for June and that, based on a successful PDR and final design review in November 2009, BIO hopes to request MREFC construction funds for NEON in the FY 2011 budget.

The BIO AC discussed:

- Disciplinary silos and how to approach the idea of interdisciplinary v. disciplinary science
- Translating what NSF is doing into policy
- How to fund trans-disciplinary projects

Budget: ARRA and FY 09 - James P. Collins, Assistant Director, BIO

Dr. Collins reported that the America Competitiveness Initiative ended with the Bush administration and the America Competes Act calls for a doubling of NSF funding over a five year period. Guidance from the National Science Board (NSB) calls for the NSF to "...continue to increase emphasis on innovation in sustainable energy technologies and education as a top priority." Dr. Collins noted that Congress passed the FY 09 omnibus bill and that NSF would be receiving an additional \$3B from the American Recovery and Reinvestment Act (ARRA) in FY 2009. NSF's policies and procedures for spending the ARRA funds were discussed.

The BIO AC discussed:

- How the decision was made to only award ARRA funds to already submitted proposals
- Over how long a period of time will NSF be allowed to spend the ARRA money
- Different approaches to funding awards with ARRA money and targeting underrepresented groups
- Pasteur's Quadrant and where NSF fits into this quadrant
- Interdisciplinary Training
 - Graduate student training grants for interdisciplinary research
 - Recruiting graduate students to solve interdisciplinary problems
- What to do about the increasing number of Biology post-docs with limited job prospects in academe and the decreasing number of Biology graduate students
- Feasibility and desirability of NSF training grants for graduate students

Leading Edge Presentations

Dr. Collins introduced the session and explained that BIO holds a Leading Edge Symposium every year in which Program Directors share with their colleagues the most exciting frontier research projects or areas being supported by their programs.

Presentations/presenters were:

Biological Innovation - *Lita Proctor, Program Director, DBI*
Reciprocal Illumination - *Adam Summers, Program Director, IOS*
Bayesian Hierarchical Models - *Tom Hobbs, Program Director, DEB*
Metabolic Links - *Elizabeth Vierling, Program Director, MCB*
Genetic Basis of Diversity - *Toby Kellogg, DEB*
Networking - *Steven Ellis, DBI*

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Undergraduate Biology Education update - Penny Firth, Deputy Division Director, DEB and Judy Skog, Division Director, DBI

Dr. Firth reported on a series of regional conversations that BIO and EHR have held with individuals interested in re-visioning undergraduate Biology education and plans for a capstone Vision and Change Conference, being organized by AAAS that will be held in July 2009.

Innovation in the Biological Sciences - Infrastructure

DBI – a new model - Judy Skog, Division Director , DBI

Dr. Skog reported on an internal year long effort to revision DBI's role in enabling advances in Biology that included a re-conceptualization of the structure needed to fulfill that role. DBI concluded that its role is to provide the resources that underpin other activities in BIO and provide large infrastructure activities with stable management. DBI fulfills this role by supporting activities that catalyze, sustain and network research resources, both physical and human. Examination of ongoing activities and how they map onto this conceptual framework continue. New DBI activities include Advances in Biological Informatics and BREAD (Basic Research to Enable Agricultural Development); a partnership with the Bill and Melinda Gates Foundation to leverage advances in plant genomics to solve agricultural problems in developing nations.

NSF Collections Survey – Judy Skog, Division Director, DBI

Dr. Skog reported on an NSF-funded survey of natural history collections that are supported by various NSF programs in BIO, GEO and SBE. This survey complements a survey of federal collections undertaken by an Interagency Working Group on Scientific Collections (IWGSC) of which NSF is a member and whose charter is to evaluate the state of object-based scientific collections at, support by, or used by US Federal agencies or in federally-supported activities. Results of both surveys will be used to inform future activities to ensure that object based scientific collections are broadly accessible to all potential users. BIO has begun to implement one of the recommendations in the report by enhancing its support for the digitization of natural history collections.

NEON - Liz Blood, Program Director, DBI

NEON will be an integrated sensing system to detect, understand and forecast the consequences of climate and land use change and invasive species on the biosphere of the U.S. at regional to continental scales. Dr. Blood briefed the committee on NEON's design, infrastructure and management, and reported on its current status with respect to recent and upcoming reviews required under the MREFC process.

Intersection of Life and Physical Sciences - Joanne Tornow, Division Director (Acting), MCB

Dr. Tornow discussed two activities that BIO has undertaken to strengthen interactions between BIO and MPS (mathematics and physical sciences). In the first, called the

Sandpit, BIO, the Engineering and Physical Science Research Council (EPSRC) of the UK (who developed the Sandpit process) and 5 other NSF directorates contributed funds to support projects that were developed and merit reviewed using a real-time, interactive process. The process involved NSF and the EPSRC identifying a grand challenge topic, in this case Synthetic Biology, and then selecting a group of 30 participants and 6 mentors who met for five days. During this period the participants coalesced into groups, identified major questions in Synthetic Biology, and then developed specific projects to address those questions. They received feedback on both the questions and projects from the mentors and each other in an iterative process that resulted in both the questions and projects becoming more focused. In the end, five groups were invited to submit proposals to BIO. These projects will be reviewed by the mentors and funded by EPSRC and NSF if they meet the NSF review criteria.

MCB is also exploring the interface between Biology and Physics by holding one interdisciplinary panel each fall to evaluate CAREER proposals submitted to the Biophysics (BIO) and Biological Physics (MPS) programs. MCB is also exploring the MCB-Chemistry interface by sharing a program director with CHE (Chemistry Division).

The BIO AC discussed:

- Innovation and noted that SGERs were created as a mechanism to support high risk, innovative research but are still a very small part of the overall NSF portfolio. They suggested that more should be done to promote these types of grants.
- Basic processes of life
 - Make sure that fundamental biological research is it is not swept under the rug and thought of as not innovative
- Graduate training grants
 - Possibly take a sandpit type approach and include graduate students to solve problems
- Bottom up approaches should still be the core of BIO

Climate Change and Sustainable Energy Priorities - *Joann Roskoski, Executive Officer, BIO*

Dr. Roskoski highlighted the new Life in Transition DCL and reiterated the NSB guidance stating: "The National Science Foundation should continue to increase emphasis on innovation in sustainable energy technologies and education as a top priority." The establishment of a collaborative BIO-GEO Integrated Global System Science activity was presented. It will involve co-locating BIO and GEO program officers who will jointly develop new activities, like the Dear Colleague Letter encouraging researchers to submit multi-disciplinary proposals in the area of Multi-scale Modeling, manage ongoing activities, like Emerging Topics in Biogeochemical Cycles, sponsor workshops, and invite scholars to spend time at NSF to help develop innovative activities that advance our understanding of Earth as an integrated system of systems.

EF-Experiments in Innovation - *James P. Collins, Assistant Director, BIO*

Dr. Collins discussed Emerging Frontiers and its role in stimulating interdisciplinary activities, establishing collaboratories, and employing novel mechanisms for identifying and supporting transformative research, such as Sandpits. Dr. Collins mentioned that BIO would explore other

novel processes for problem solving such as crowd sourcing and clean slate, conduct creativity training for Program Directors and continue to support synthesis activities.

May 1, 2009

Meeting with Drs. Arden Bement and Cora Marrett

Dr. Bement reported that ARRA had increased NSF's budget by 55% over the appropriated FY 09 budget.

The BIO AC and Drs. Bement and Marrett discussed:

- The future of Life Sciences at NSF
 - Focus on frontier science and approaches
- Size of NSF
 - Increasing international activities
 - New tools coming online including NEON
 - Staffing implications of NSF budget growth
 - Developing new capabilities for new programs
- NSF
 - Have to keep improving productivity, e.g. Fastlane
 - Virtualization
 - Bringing good talent into NSF
- Resources for facilities, infrastructure and instrumentation
- Education
 - Interdisciplinary
 - Implications for teaching
- New programs and fostering relationships
- NSF priorities should be:
 - Focused on frontier - funding ideas
 - Shifting resources back to frontier
 - Look for new concepts, higher risk ideas
 - Foster International Collaboration
 - Invest more in cyberinfrastructure and cyberinfrastructure tools
 - Continue to invest in major tools and facilities
- Private sector more prominently represented in our centers
 - Private sector has interest in working with NSF

IOS and MCB COV Reports from AC Representatives

In general, both COVs found that IOS and MCB efficiently and effectively managed the merit review process and that the resulting portfolio of awards was balanced and composed of innovative science and education projects.

Report on IOS COV by AC Representative Dr. Daniel Wubah

Specific Discussion Topics:

Attention to Broader Impacts needs to continue especially with respect to reviews
New PI Funding Rates
Funding distribution across clusters
Changes to IOS external website

Report on MCB COV by AC Representative Dr. Richard McCombie

- Specific Discussion Topics:

Second award to new PIs is very hard to get

MCB Staff Workload

Better documentation of individuals trained on BIO awards and of outreach activities

Standardized reporting methods suggested

The Spring Advisory Committee was adjourned at 12:00pm

APPROVED:

Michael Mares, Chair

Date